

GROWTH BEHAVIOUR OF FOREST TREE SPECIES

The State of Kerala is endowed with high rainfall and ideal climate conditions which favour growth of a wide variety of tree crops. Planting of quick growing multipurpose tree species which can meet the various needs of the community is of great importance in social / farm forestry systems. Trees will also help in arresting the deterioration of the environment and improving the quality of life of people. To achieve the above objectives, a thorough knowledge of growth habit of trees is inevitable. With this objective, the study was undertaken to select the fast growing species suitable for the region.

The present study was carried out at the College of Forestry, Kerala Agricultural University, Vellanikkara, Kerala. This is a tropical area with warm humid climatic condition and an annual rainfall of about 3000 to 3500 mm. The temperature normally ranges from 25°C to 35°C. The study area lies between 10° 30' N latitude and 76° 36' E longitude.

For the study, 25 tree seedlings each of 45 species planted in an area about 2 ha were used. The height and girth of individual trees were measured at half yearly intervals for a period of three years from 1991 to 1994. The soil samples were also collected at periodic intervals from the arboretum and analysed for pH, organic carbon, available phosphorus and available potassium following the standard procedures as suggested by Jackson (1958).

1. Periodic increment in height

The analysis of data revealed that though *Acacia auriculiformis* A. Cunn. ex Benth. showed fast growth during the first two years, *Cassia renigera* Wall. showed maximum growth increment in the third year followed by *Cassia nodosa* Ham. ex Roxb.

Statistical analysis of the data (Table 1) revealed that maximum total growth increment at the end of the third year was shown by *Albizia falcataria* (L) Fosberg. (8.86 m) followed by *Cassia renigera* Wall. (7.65 m), *Trema orientalis* (L.) Bl. (7.61 m), *Acacia mangium* Willd (6.69 m), *Acacia auriculiformis* A. Cunn. ex Benth. (6.54 m) and *Macaranga indica* Wt. (6.53 m) while species like *Jacaranda mimosifolia* D. Don (0.6 m), *Dalbergia latifolia* Roxb. (1.06 m) and *Samadera indica* Gaertn. (1.48 m) recorded the least growth.

Growth evaluation and behaviour studies conducted by Svenson (1988) have revealed variation in growth of tree species in terms of height. *Leucaena leucocephala* and *Eucalyptus camaldulensis* have been identified as highly fast growing species by him.

Burnett and Ngulb (1988) conducted a similar type of study with 68 species. The results indicated that there is a lot of variation in growth behaviour of trees. In general, *Eucalyptus* species performed best followed by *Glyricidiasepium*, *Leucaena leucocephala* and *Leucaena diversifolia*. Muhammed et al. (1988) reported that height growth of *Casuarina equisetifolia*, *Eucalyptus grandis* and *Eucalyptus tereticornis* was much better compared to other species.

Sheikh (1988) conducted a study to find out the growth rate of various species in Pakistan. The growth of *Trema undulata*, *Acacia mode-rata*, *Acacia albida*, *Acacia tortilis*, *Prosopis juliflora* and *Pakeinssonina aculeata* was poor during heavy rainfall months. With reference to total growth increment, 6.67% of trees come under very high class (7.1 - 9 m); 22.22% in high class (5.1 - 7 m); 42.22% in medium class (3.1 - 5 m) and 28.89% in low class (1 - 3 m).

Table 1. Growth increment in height and girth of various tree species

Sl. No.	Botanical name	Total growth increment in three years	
		Height, m	Girth, cm
1	<i>Acacia auriculiformis</i> A. Cunn. ex Benth	6.54	48.21
2	<i>Acacia mangium</i> Willd.	6.64	44.56
3	<i>Adenanthera pavonina</i> L.	4.61	29.90
4	<i>Albizia falcataria</i> (L.) Fosberg	8.86	52.63
5	<i>Ailanthus triphysa</i> (Dennst.) Alston	3.44	33.48
6	<i>Anacardium occidentale</i> L.	4.37	32.24
7	<i>Annona squamosa</i> L.	1.77	12.00
8	<i>Artocarpus heterophyllus</i> Lamk.	4.37	33.32
9	<i>Artocarpus incisa</i> L.f.	2.96	18.70
10	<i>Azadirachta indica</i> A. Juss.	3.35	22.96
11	<i>Bauhinia purpurea</i> L.	4.12	43.85
12	<i>Bixa orellana</i> L.	3.38	32.39
13	<i>Bridelia retusa</i> (L.) Spreng.	4.97	45.80
14	<i>Cassia javanica</i> L.	4.60	33.46
15	<i>Cassia nodosa</i> Ham. ex Roxb.	5.96	38.00
16	<i>Cassia renigera</i> Wall.	7.65	51.02
17	<i>Casuarina equisetifolia</i> J. R&G. Forst	6.15	27.57
18	<i>Ceiba pentandra</i> (L.) Gaertn	5.66	53.21
19	<i>Dalbergia latifolia</i> Roxb.	1.06	8.57
20	<i>Delonix regia</i> (Boj.) Rafin.	6.02	41.38
21	<i>Harpullia arborea</i> (Blanco) Radlik.	2.17	10.86
22	<i>Holarrhena antidysenterica</i> Wall. ex A.DC.	2.05	15.05
23	<i>Hydnocarpus wightiana</i> Bl.	3.35	23.26
24	<i>Hymenodictyon excelsum</i> (Roxb.) Wall.	2.91	33.80
25	<i>Indigofera teysmani</i>	3.72	38.13
26	<i>Jacaranda mimosifolia</i> D. Don	0.60	9.77
27	<i>Lagerstroemia speciosa</i> Pers.	3.83	31.62
28	<i>Leucaena</i>	5.54	22.85
29	<i>Macaranga indica</i> Wt.	6.53	49.49
30	<i>Mangifera indica</i> L.	2.84	25.65
31	<i>Morus alba</i> L.	4.54	34.32
32	<i>Oroxylum indicum</i> (L.) Vent.	2.05	20.45
33	<i>Peltophorum pterocarpum</i> (DC.) Vaker ex Heyne	4.36	31.94
34	<i>Phyllanthus emblica</i> L.	3.68	26.59

Table 1 (continued)

Sl. No.	Botanical name	Total growth increment in three years	
		Height, m	Girth, cm
35	<i>Polyalthia longifolia</i> (Sonner) Thw.	2.58	16.24
36	<i>Psidium guajava</i> L.	3.70	19.27
37	<i>Pterocarpus marsupium</i> Roxb.	4.44	26.37
38	<i>Pterocarpus santalinus</i> L.f.	4.11	25.52
39	<i>Samadera indica</i> Gaertn.	1.48	11.00
40	<i>Santalum album</i> L.	2.12	13.08
41	<i>Spathodea capanulata</i> Beauv.	4.71	41.15
42	<i>Swietenia macrophylla</i> King	5.13	32.74
43	<i>Syzigium cumini</i> (L.) Skeels	2.41	20.06
44	<i>Terminalia catappa</i> L.	5.17	38.31
45	<i>Trema orientalis</i> (L.) Bl.	7.61	54.31

2. Periodic increment in diameter of tree species

From the data, it is clear that at the end of the first and second years, *Trema orientalis* (L.) Bl. showed faster growth in diameter. Interestingly during the third year, greater girth increment was shown by *Cassia renigera* Wall. On considering the total girth increment in diameter, the highest was recorded by *Trema orientalis* (L.) Bl. (54.31 cm) followed by *Ceiba pentandra* (L.) Gaertn. (53.21 cm), *Albizia falcataria* (L.) Fosberg (52.63 cm), *Cassia renigera* Wall. (51.02 cm) and *Maca-ranga indica* Wt. (49.49 cm). Based on the data the species like *Dalbergia latifolia* Roxb. (8.57 cm), *Jacaranda mimosifolia* D. Don (9.77 cm) and *Harpullia arborea* (Blanco Radlik. (10.86 cm) could be considered as slow growing.

In the sandy soils of Sri Lanka, *Casuarina equisetifolia* attained a girth of 23.3 cm in the sixth year and 26.4 cm in seventh year. The annual girth increment was 2.4 cm and the mean annual increment was 3.8 cm in the ninth year (Vivekanandan, 1931).

The percentage of trees that come under very high (45.1 - 60 cm), high (31 - 45 cm), medium (20.1 - 35 cm) and low (9 - 20 cm) classes in terms of total girth increment were respectively 15.56, 15.56, 46.67 and 22.22 per cent.

3. Soil nutrient status in relation to tree growth

On an average, the pH of the study area was slightly acidic (6.02). The organic carbon content was 2.81 per cent, while available P and K were found to be 15.37 and 280.18 kg ha⁻¹ respectively. The soil nutrient status did not vary significantly between the locations. It can be concluded that the difference in growth behaviour of trees in terms of height and girth is not due to soil factors, but is due to genetical factors.

The present study emphasises that suitable species could be selected for commercial planting for various agro / social forestry programmes. Fast growing species could be further multiplied by vegetative means. From the present study, the species like *Albizia*

falcataria (L.) Fosberg, *Trema orientalis* (L.) Bl., *Cassia renigera* Wall., *Acacia auriculiformis* A. Cunn. ex Benth., *Macaranga indica* Wt., *Delonix regia* (Boj) Rafin., *Acacia mangium* Willd and *Bridelia retusa* (L.)

Sprng. can be regarded as fast growing in terms of height and girth. Hence, these species could be further multiplied for intensive planting under agro / social forestry programme.

College of Forestry
Vellanikkara 680 656, Trichur, India

K. Gopikumar, S. Bindu
Y. M. Shajikumar

REFERENCES

- Burnett, D. W. and Ngulb, M. 1988. Which are the fast wood and polewood for your area. *Newsletter*. Forestry Research Institute, Malawi, 65 : 8-12
- Jackson, M. L. 1958. *Soil Chemical Analysis*. Prentice Hall Inc., London, p. 111-205
- Muhammed, E., Chacko, K. C., Sasidharan, N. and Thomas, P. 1988. Study of afforestation techniques in grass lands of Kerala. *KFRIR Research Report* 52(ii) : 8
- Sheikh, M. I. 1988. New species for afforestation in semi arid lands. *Pakistan J. For.* 34(4) : 249-254
- Svenson, J. 1988. Afforestation of clayey soils in northern Mozambique, an evolution of a species trial. A minor field study. *Arbetrapport, U - land sardelningen Sveriges Lant bruk sunivesital.* 93, 50. PPISB 91-576-3634-6
- Vivekanandan, K. 1981. The studies of casuarina in Sri Lanka. *Casuarina-Ecology, Management and Utilization. Proc. International Workshop*, Canberra, Australia. p. 99-103